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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/645,903	08/25/2000	Li Li	2269-3361.2US (97-0663.02)	6825
24247	7590	06/26/2008	EXAMINER	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			SUCH, MATTHEW W	
			ART UNIT	PAPER NUMBER
			2891	
			NOTIFICATION DATE	DELIVERY MODE
			06/26/2008	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USPTOMail@traskbritt.com

<b>Office Action Summary</b>	<b>Application No.</b> 09/645,903	<b>Applicant(s)</b> LI, LI	
	<b>Examiner</b> Matthew W. Such	<b>Art Unit</b> 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 10-28, 30-34 and 36-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 10-28 and 30-34 is/are allowed.
- 6) ☒ Claim(s) 36-38 is/are rejected.
- 7) ☒ Claim(s) 32 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Objections***

1. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 36, 37 and 38 must be renumbered (as best can be determined) to claims 35, 36 and 37, respectively. Appropriate correction is required.

2. Claim 32 is objected to because of the following informalities: the phrase "at least portion of the barrier layer" in Line 3 should read "at least a portion of the barrier layer".

Appropriate correction is required.

3. Claim 37 is objected to because of the following informalities: the phrase "wherein exposing the opening to the phosphoric" in Line 1 should read "wherein the exposing the opening to the phosphoric" in order to avoid potential confusion about whether the recitation of "exposing the opening" recited in claim 37 is intended to be an additional "exposing" step distinct from the "exposing the opening" required by claim "35" (if renumbered).

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4. Claim 37 is objected to because of the following informalities: the phrase "before removing the barrier layer" in Line 2 should read "before the removing the barrier layer" in order to avoid potential confusion about whether the recitation of "removing the barrier layer" recited in claim 37 is intended to be an additional "removing" step distinct from the "removing the barrier layer" required by claim "35" (if renumbered).

5. Claim 38 is objected to because of the following informalities: the phrase "wherein exposing the opening to a nitric" in Line 1 should read "wherein the exposing the opening to the nitric" in order to avoid potential confusion about whether the recitation of "exposing the opening" recited in claim 38 is intended to be an additional "exposing" step distinct from the "exposing the opening" required by claim "35" (if renumbered).

6. Claim 38 is objected to because of the following informalities: the phrase "is followed exposing the opening to a phosphoric acid-containing" in Line 2 is unclear as to the intended meaning (see also claim 38 below under 35 U.S.C. 112, second paragraph).

***Claim Rejections - 35 USC § 112***

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 37 and 38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant

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regards as the invention. The claims each are dependant on claim 35 as a base claim. However, claim 35 does not exist. For the purposes of compact prosecution, the Examiner provisionally interprets that claims 37 and 38 are dependant on claim 36.

9. Claim 38 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The phrase "is followed exposing the opening to a phosphoric acid-containing solution" renders the claim indefinite because it is unclear exactly when the opening is actually exposed to the nitric-acid solution (i.e. before or after phosphoric acid-containing solution). For the purposes of compact prosecution, the examiner provisionally interprets that the phrase reads "is followed by exposing the opening to a phosphoric acid-containing solution" (nitric acid-containing solution is before the phosphoric acid-containing solution).

### ***Claim Rejections - 35 USC § 102***

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. In so far as definitive, claims 36-38 are rejected under 35 U.S.C. 102(b) as being anticipated by Temple ('385).

a. The examiner notes that the phrase "to form an oxide polymer layer on surfaces of the opening" in Lines 3-4 merely is a recitation of an intended outcome or result of the step of "removing at least a portion of a dielectric material exposed through an opening in an etch mask" which does not actually require "forming an oxide polymer layer on surfaces of the opening".

The examiner notes that the phrase "to expose at least a portion of a metal-containing layer and to form a metal polymer layer over the surfaces of the opening" in Lines 5-6 merely is a recitation of an intended outcome or result of the step of "removing a barrier layer underlying the opening" which does not actually require "exposing at least a portion of a metal-containing layer and forming a metal polymer layer over the surfaces of the opening".

The examiner notes that the phrase "to substantially remove the metal polymer layer" in Lines 7-8 merely is a recitation of an intended outcome or result of the step of "exposing the opening to a nitric acid-containing solution" which does not actually require "substantially removing the metal polymer layer".

The examiner notes that the phrase "to substantially remove the oxide polymer layer" in Lines 9-10 merely is a recitation of an intended outcome or result of the step of "exposing the opening to a phosphoric acid-containing solution" which does not actually require "substantially removing the oxide polymer layer".

Language that merely expresses an intended use/outcome/result of a specific step in a method claim does not narrow scope of the method claim past the specific recited

step. See MPEP § 2106 II C and MPEP § 2111.04. As such, the aforementioned language does not further limit the scope of the claimed invention.

b. Temple teaches a method of fabricating a via for a semiconductor device by removing a least a portion of a dielectric material (Element 90; Figs. 3-4B) exposed through an opening (Element 94; Fig. 3) in an etch mask (Element 92; Fig. 3). A nitric acid-containing solution is applied to the opening (Col. 12, Lines 66-68 and Col. 13, Lines 1-2; Fig. 4B) and then a phosphoric acid-containing solution is applied to the opening (Col. 15, Lines 5-15; Fig. 9) and then a barrier layer (Element 74) is removed from the underlying of the opening (Col. 15, Lines 5-15; Fig. 9; Fig. 9). The examiner notes that the phosphoric acid-containing solution removes nitride (Element 76) necessarily before barrier layer (Element 74) is removed.

***Allowable Subject Matter***

12. Claims 10-28 and 30-34 are allowed.

13. The following is an examiner's statement of reasons for allowance:

c. Regarding claims 10-20, a search of the prior art does not disclose or reasonably suggest a method of applying a solution consisting essentially of nitric acid to an opening extending through a dielectric layer and an exposed metal-containing layer without

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substantially removing the metal-containing layer followed by a phosphoric acid dip in the context of the entire claim.

d. Regarding claims 21-28 and 30-34, a search of the prior art does not disclose or reasonably suggest a method of cleaning a partial via in a dielectric layer having an exposed barrier layer with a phosphoric acid-containing solution including a fluorine-containing component followed by etching the barrier layer after the cleaning defining a bottom surface by a metal-containing trace and applying a nitric acid-containing solution in the context of the entire claim.

14. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Response to Arguments***

15. Applicant's arguments with respect to claims 36-38 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:



Burkman (Chapter 3 "Aqueous Cleaning Processes" of Handbook of Semiconductor Wafer Technology, Werner Kern, ed.) teaches various wet acid solutions useful for cleaning semiconductor substrates contaminated with various species, such as polymers and metals.

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

#### ***Contact Information***

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew W. Such whose telephone number is (571) 272-8895. The examiner can normally be reached on Monday - Friday 9AM-5PM EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bradley W. Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew W. Such  
Examiner  
Art Unit 2891

MWS  
6/20/08

/Douglas M Menz/

Primary Examiner, Art Unit 2891

6/21/08